ALL YOU NEED TO KNOW

SHIELD BATTERIES Powering the Future Since 1910

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BEFORE HANDLING, CHARGING OR INSTALLING BATTERIES, PLEASE UNDERSTAND AND COMPLY WITH THE PRECAUTIONS GIVEN IN HEALTH & SAFETY INFORMATION' IN THIS CATALOGUE.

1. STORAGE

a) Always rotate your stock. Practice first in, first out. Batteries slowly lose their charge, and good stock-rotation stops batteries going flat in storage, and makes sure that the customer buys a good battery.
b) Store batteries in a cool, dry well ventilated area.
c) Protect batteries from excessive heat. (Heat causes batteries to lose their charge more quickly, and excessive heat can damage batteries).
d) Store batteries in an upright position to prevent them falling over or leaking.
e) Do not stack batteries on top of other batteries to avoid scratching, tearing labels and damaging terminals that stand proud of the lid.
f) Store batteries on racks or on pallets - not on the floor. Small stones or sharp points on a concrete floor can damage the base of the battery and cause leakage.
g) Make sure handles are left flat (in the down position). Upright handles are more likely to be damaged.

2. MAINTENANCE OF STOCK

WET BATTERIES

a) Check the open-circuit voltage of the batteries in your stock every month using a digital voltmeter or a multimeter. If you have a voltage below 12.50V (6.25V for 6V batteries), give them a refreshing charge. (See Section 7).
b) Scrap any batteries that drop below 11.00V - these batteries will have developed a sulphation that cannot be completely reversed by charging, and so will not give the expected performance and life to the customer.

DRY CHARGED BATTERIES

a) If you keep the batteries cool and dry and do not remove the seal, dry charged batteries do not need any other attention.
b) The maximum storage time of dry charged batteries before they are commissioned by filling with acid is 24 months.

3. COMMISSIONING

WET BATTERIES

a) Do not supply a battery to a customer (end user) if the voltage is below 12.50V (6.25V for 6V batteries). Charge any batteries with voltages below these values.
b) We recommend you check the condition of the battery before selling it.

DRY CHARGED BATTERIES

a) Only commission a dry charged battery when it is needed for a customer.
b) If fitted, remove and discard any sealing plugs, tape or foil.
c) If fitted remove and keep normal vent plugs and terminal covers (usually red and black).
d) For filling, use a battery grade dilute sulphuric acid of specific gravity 1.270 - 1.280 at 25°C conforming to BS3031 or better (N.B. contaminated acid with impurities can seriously damage the life of the battery, in some cases reducing this to a few days. Do not use acid from old batteries).
e) The temperature of the acid and the battery should both be at room temperature in the range of 15 - 30°C.
f) Fill each cell with the acid to a level of 8 - 15mm above the tops of the plates. Fill each cell one after the other and complete the filling in one operation.
g) Leave the battery for 20 - 30 minutes and then measure the open-circuit voltage. If it is below 12.50V, charge the battery. If it is above 12.50V, adjust the acid levels to the correct operating levels with dilute sulphuric acid of specific gravity 1.270 - 1.280.
h) Fit the normal vent plugs and terminal covers.
i) Wash the battery with hot water and dry it.
j) Performance checks on newly commissioned dry charged batteries using modern electronic digital testers using conductance technology are not recommended (examples are - testers supplied by Midtronics or Bosch). The results can be misleading until the battery has undergone some service use.

4. ELECTROLYTE LEVELS (ACID) LEVELS IN SERVICE

PLEASE READ BEFORE ADJUSTING ACID LEVELS

i) Do not top up to the maximum levels a battery that needs charging as levels rise on charging. However, if the levels are below the tops of the separators, top up with distilled or de-ionised water until the separators are just covered.
ii) Adjust levels to the maximum levels only after the battery has stood for at least an hour after charging.
iii) Never overfill a battery as the acid may come out of the vent plugs when the battery is being charged.
iv) Use only distilled or de-ionised water for topping up. Sulphuric acid should never be used except for the initial filling of a battery.

a) When the battery is in service, the electrolyte levels should be checked and adjusted to the levels given below.
b) If the battery has a maximum level line on the side of the container fill to this level.
c) If there is no maximum line but there are filling tubes projecting from the bottom of the lid, fill to the bottom of the tubes.

d) If there is no maximum line nor filling tubes in poly-propylene batteries, fill to 7mm (0.25 inches) below the bottom edge of the lid skirt.
e) If there is no filling tubes in hard rubber batteries, fill to 15mm (0.5 inches) above the tops of the separators.

5. SELECTING THE CORRECT BATTERY FOR THE APPLICATION

CAR & COMMERCIAL VEHICLE (CV) BATTERIES

a) Select the specified battery from the Application Section of this catalogue.
b) On 24 Volt systems, or when 2 x 12 Volt batteries are fitted in parallel, both batteries should be replaced at the same time. Failure to do this will result in greatly reduced battery life for the new battery that has been fitted.
When batteries are joined in series, the negative terminal of one battery is connected to the positive terminal of the other, giving a total voltage of 24 Volts. The Ampere-hour capacity of the system is the same as that of the individual batteries.
When batteries are joined in parallel, the positive terminals of the two batteries are connected together, and the negative terminals of the two batteries are also connected together. The voltage of the system remains unchanged at 12 Volts but the Ampere-hour capacity of the system is double that of the individual batteries.

LEISURE BATTERIES

a) Use the battery with the performance and size recommended by the equipment supplier.
b) We recommend that a leisure battery in a cycling application, should be sized so that it is not normally discharged to more than 50 percent state of charge. This will ensure that the battery gives a good life. The life of a battery regularly discharged by 50 percent is about 5 times that of a battery regularly discharged to 100 percent i.e. a load of 3A for 10 hours will discharge a battery by 30AH. If this represents 50 percent state of charge, we would recommend a 60 AH battery.

6. REMOVING AND INSTALLING BATTERIES ON VEHICLES

REMOVING BATTERIES

a) It is good practice to tell the customer that while you will do your best to keep the memory settings, it is possible these might be lost.
b) Make sure the hand-brake is on, and that the car is in neutral or park. Switch off all electrical loads and remove the ignition keys from the car. N.B. On some cars, the doors will lock when the battery is disconnected so this is why the key should be removed from the car. Also, switch off any non-factory fitted alarms.
c) Check that the cigar lighter is still working - if not, turn the ignition key to the auxiliary position. Install a Computer Memory Saver (CMS).
d) Disconnect the earth connector first - this is normally the negative on modern vehicles. This can result in the loss of memory settings (please refer to the vehicle handbook).
e) Disconnect the live connector second. If a CMS is used, the connector will still remain live after it has been disconnected. To prevent the connector shorting against the car, place an insulator such as a rubber glove over the connector.
f) Remove the hold-down clamps.

PREPARATION OF A BATTERY FOR FITTING

a) Check that the battery has the correct polarity for the vehicle.
b) Check that the battery has the correct height for the vehicle - if a battery is too high it can short out on the bonnet or the bottom of the seat, or it can damage the bonnet.
c) It is good practice to place the old and new battery side by side to compare polarities, hold-downs and performance levels.
Some batteries have hold-downs at both sides and ends. Only the ones used for securing the battery on the vehicle need to be checked.
d) Check that the battery is clean and dry.
e) Check that the vent plugs or manifolds are firmly in place.
f) Check that the battery has a voltage of above 12.50V. If not, charge the battery or use another that has a voltage above 12.50V.
g) Ensure the two terminal caps are still fitted at this stage.

PREPARATION OF THE VEHICLE

a) Clear away any items on the battery tray which might damage the battery - placing a heavy battery on a piece of sharp grit can puncture the bottom of the battery.
b) Check that the connectors, the hold-down clamps and the tray are clean and corrosion free - if there is any corrosion, hot water will instantly remove this.
c) Check that the alternator drive belt tension is correct (refer to the vehicle handbook or service manual).
d) It is recommended that the electrical system and particularly the charging system of the vehicle, be checked to make sure it is operating correctly (refer to the vehicle handbook or service manual).

INSTALLING THE BATTERY

a) Fit and tighten the hold-down clamps. These should be tight enough to secure the battery and not allow it to move - DO NOT OVER TIGHTEN.
b) Connect the live connector first to the correct battery terminal (usually the positive) after removing the terminal cap. DO NOT OVER TIGHTEN.
c) Connect the earth connector to the other terminal after removing the terminal cap. DO NOT OVER TIGHTEN.
d) Place both terminal caps on the old battery that has been removed from the vehicle to avoid the possibility of short circuits.
e) Replace onto the new battery, any components that have been taken from the old battery such as exhaust tubes, vent elbows, terminal covers, removable hold-down strips (widgets) etc.
f) The use of petroleum-jelly (Vaseline) is not necessary on modern polypropylene batteries, but there is no disadvantage in smearing a small amount lightly on the terminals. This is still recommended for hard rubber batteries - Do not use grease.
g) Remove the CMS.
h) Start the engine.
i) For non-automotive applications, install the battery in line with the equipment supplier's recommendations.

7. CHARGING OFF-VEHICLE

PLEASE READ BEFORE CHARGING BATTERIES

i) Do NOT charge a battery if it's temperature is below 3℃ as the electrolyte may have frozen.
ii) Charging the battery on the vehicle is not recommended.
iii) Refer to Section 6 for information about removing the battery from the vehicle.
iv) 'Sealed' vehicle batteries should be charged only on constant potential chargers or 'smart' chargers. Do not charge on constant current chargers or boost chargers. 'Sealed' vehicle batteries do not allow any access to the electrolyte and so cannot be topped up as there are no removable vent plugs or manifolds - the battery is able to vent gases through breathing holes and so is not strictly sealed.
v) A new, unused battery with a voltage below 11.00V should be scrapped and not charged (see Maintenance of Stock section).

GENERAL PROCEDURE FOR ALL TYPES OF CHARGERS

This section gives common information for all types of chargers. The sections following give details for different types of charger.

a) Check the electrolyte levels in all the cells. If these are below the tops of the separators, top up with distilled or de-ionised water to the top of the separators. Do not fill to a higher level before charging - adjust the levels after charging.
b) If you are using a constant current charger or boost charger, remove the vent plugs or manifolds before charging (see below). If you are using a constant potential or a 'smart' charger there is no need to remove the vent plugs or manifolds.
c) Check that the charger is switched off.
d) When fitting the charger to the battery, connect the positive lead to the positive terminal and the negative lead to the negative terminal.
e) Switch on the charger (see below for the correct charging conditions depending on your type of charger).
f) Stop charging if the battery begins to gas freely (some gassing is normal during the last stages of charging) or if the battery temperature rises above 50℃.
g) Switch off the charger.
h) It is good practice to wait for about 20 minutes for the gasses to clear before removing the leads from the battery as some chargers remain live and can cause a spark.
i) Check the electrolyte levels in all the cells and top up if necessary.
j) Refit vent plugs or manifolds if these have been removed.
k) Wash the battery with hot water and dry it.
l) N.B. Many customers severely underestimate the amount of time necessary to charge a flat battery - this results in customers returning batteries saying that they have charged the battery but that it is still not holding a charge.

working principles and the procedures for using these is given below.

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SECTION	CHARTER TYPE
A	Constant Current Chargers
B	Constant Potential Chargers
C	Modified Constant Potential Chargers
D	'Smart Chargers'
E	Boost Chargers

A CONSTANT CURRENT CHARGERS

These maintain a fixed, constant, preset current through the charging period irrespective of the battery on-charge voltage.

Charging Procedure with Constant Current Chargers

1 Ideally, charge each battery on a separate charger unit. If this is not possible, charge batteries in parallel because it is not possible to control the amount of current passing through each battery.
If batteries in different states-of-charge are being charged in series, each battery should be removed as soon as it is charged (if you wait until the last battery is charged, some of the batteries will be overcharged.
2 Measure the open-circuit voltage of the battery. To obtain a stable voltage, the battery should not have been used or charged for a minimum of 3 hours prior to checking the voltage.
3 Charge the battery at the recommended charge rate (see battery specifications section). If you cannot set the recommended rate, extend or reduce the charging time on a pro rata basis. For example, if the recommendation is to charge the battery at 4.0A for 6 hours (24AH = 4.0A x 6), charge the battery for 12 hours if you can only set the charger at 2.0A (24AH = 2.0A x 12)
4 Charge the battery for the number of hours shown in the table below depending on the open-circuit voltage. For example, if the battery has a voltage of 12.16V, charge it for 10 hours at the recommended charge rate.

OPEN CIRCUIT VOLTAGE (V)	CHARGING TIME (HOURS)
Above 12.40	4
12.31 - 12.40	6
12.21 - 12.30	8
12.11 - 12.20	10
12.01 - 12.10	12
11.91 - 12.00	14
11.81 - 11.90	16
11.71 - 11.80	18
11.00 - 11.70	20
Below 11.00	See paragraph 5 below

5 If you are charging a battery below 11.00 (overdischarged) that has been in service, a specialised charger capable of providing a very high charging voltage may be necessary, and the recommended current may not be obtainable at first. In this case, monitor the current and adjust as necessary during the charge.
If a battery has become overdischarged, it will have lost both life and performance because of irreversible sulphation. Charging may reduce further it's potential life.

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7. CHARGING OFF-VEHICLE

B CONSTANT POTENTIAL CHARGERS

These maintain a fixed, constant, preset voltage throughout the charging period. The current cannot be set and will fall as the battery state-of-charge increases.

Charging Procedure with Constant Potential and Modified Constant Potential Chargers

1 These chargers are normally designed to charge one battery at a time.
2 Stop charging when the battery is gassing freely and the battery voltage shows no increase over a period of at least 2 hours.
3 N.B. The majority of constant potential chargers are incapable of charging a severely overdischarged (below 11.00V) battery in a realistic period of time. A minimum of 24 hours is normal. Also, It may be impossible to charge an overdischarged battery.

C MODIFIED CONSTANT POTENTIAL CHARGERS

The majority of commercial chargers, particularly home chargers, are this type, and allow neither the voltage nor the current to be preset.

Charging Procedure with Modified Constant Potential Chargers

1 Use the same procedure for Constant Potential Chargers

D 'SMART' CHARGERS

The latest generation of chargers, is able to check the battery condition and to supply automatically a controlled charge that will charge the battery in the fastest time without overcharging it at the end of the charge. Some 'Smart' chargers have a special setting for all-calcium batteries and will charge these from flat, which most other chargers are unable to do.

Charging Procedures with 'Smart Chargers

1 Follow the manufacturers instructions.
2 These chargers should be able to charge overdischarged (below 11.00V) batteries. N.B. Some have a special setting for all-calcium batteries.

E BOOST CHARGERS

These provide a very high initial current, and are used mainly to put some charge into a flat battery when it is needed urgently by the customer. The current falls as the battery state-of-charge increases, and the battery temperature is monitored to make sure that it does not overheat.

Charging Procedures with Boost Chargers

1 Boost charging is not recommended except in exceptional circumstances e.g. a stranded customer, as this will reduce battery life, especially if a battery is boost-charged more than once.
2 Never boost-charge any battery that is below 11.00V as it will be too sulphated to accept a charge; scrap the battery or charge normally.
3 Only use a boost-charger that limits the charging voltage to a maximum of 14.2 Volts and that has a temperature monitor.
4 Follow carefully the charger-manufacturer's instructions.

8. CHECKING BATTERY PERFORMANCE

CCA Testing using Digital Conductance Battery Testers

There are many different types of hand held Digital Conductance Battery Testers on the market; Please Note

a) They are not a reliable method of checking the fully developed cold-cranking performance of a NEW battery. They are designed for the testing and evaluation of suspect or used batteries.
b) Different makes of tester, and even different testers of the same make can give different results.
c) Plate design can affect the readings. Different readings will be experienced for batteries with standard lead-antimony plates from those with calcium-hybrid or calcium-calcium plates. Flooded batteries will give different readings to AGM or GEL batteries.
e) The condition of leads and terminal connectors can influence the reading on hand held testers.
f) A battery that is aged may still be serviceable but because of wear & tear may only give a reduced health reading.

Open-Circuit Voltage and High-Rate Discharge Testers

a) Measure the open-circuit voltage of the battery using a digital voltmeter or a multimeter. To obtain a stable voltage, the battery should not have been used or charged for a minimum of 3 hours before checking the voltage.
b) If the voltage is below 12.60V, charge the battery in accordance with Section 7 (Charging Off-Vehicle) above. Note: This type of tester will only give an accurate result on a fully-charged battery. A common mistake is to use this type of tester on a discharged battery, and to judge that the battery is faulty is a cell is seen to 'boil'. A boiling' cell on a flat battery does not mean that the battery is faulty.
c) Apply a current-load equal to three times the 20HR rate for 10 seconds. e.g. battery capacity 45 ampere hour (AH) = 3 x 45 = 135 amps. The voltage during discharge should be stable at 9.6 volts or over. Use an approved calibrated tester.
d) If the voltage after 15 seconds is stable and above 9.60V, the battery is in a satisfactory condition with no faults.
e) If the voltage is below 9.60V after 15 seconds and it is unstable, normally falling quickly, the battery should be replaced.

'DROP TESTERS'

a) 'Drop Testers ' have 2 spikes that are pressed into the tops of the battery terminals and a simple voltmeter to check the discharge voltage.

9. MAINTENANCE IN SERVICE

General

a) Always refer to the information contained in the handbook or brochure supplied with the vehicle or equipment.

Definition of Maintenance-Free

a) All Shield starter batteries for cars and commercial vehicles conform to the relevant sections of BS EN 60095 for maintenance-free characteristics.
This means that in normal vehicle applications and temperate climate operation, it is not necessary to add water.
b) Shield batteries are designed to be topped up with water if water should be lost owing to, for example, a charging system fault, prolonged operation in hot climates, excessive off-vehicle charging etc.

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c) Note: The term maintenance-free applies only when the battery is used in an approved automotive or commercial application.

Definition of Low Maintenance

a) Low maintenance batteries in normal vehicle applications in temperate climate operation need water-addition only at yearly intervals.
b) Shield batteries are designed to be topped up with water if water should be lost owing to, for example, a charging system fault, prolonged operation in hot climates, excessive of-vehicle charging etc.
c) Note: The term low maintenance applies only when the battery is used in an approved commercial vehicle application.

Battery Maintenance in Automotive Applications

a) Carry out the checks below at the recommended vehicle service intervals.
b) Check the electrolyte-level and top up with water if necessary. See Section 4 (Electrolyte-Levels) for details about how to do this. (As explained above, it should not be necessary to add water unless the battery has encountered exceptional conditions).
c) Check that the battery is clean and dry and that the vents are not obstructed.
d) Check that the terminal-connectors and the hold-down clamps are securely connected and corrosion free.
e) If the battery is on a vehicle that is not to be used for an extended period (more than 1 month), disconnect it from the vehicle. Refer to Section 6 (Removing Batteries) to do this. Modern cars have electrical accessories that slowly discharge the battery even when the ignition key has been removed.
Some accessories such as alarms, trackers, and phones can cause a battery to become discharged in a few weeks.
f) Fully charge the battery before storage and give it a refreshing charge every 3 months (see Section 7 Charging-Off Vehicle).

Battery Maintenance in Non-Automotive Traction and Deep Discharge Applications

a) Typical applications are lawnmowers, electric wheel-chairs, caravans, etc. The Leisure / Semi-Traction Battery range is recommended for these applications standard vehicle batteries are not suitable.
b) Ensure that the battery is always kept in as high a state-of-charge as possible. Always recharge immediately after use.
c) Check the electrolyte levels on a regular basis dependent upon use.
Charging batteries regularly on a non-vehicle charging system may result in a higher rate of water-loss.
d) Check that the battery is clean and dry and that the vents are not obstructed.
e) If the battery is not to be used for an extended period (more than 1 month), fully charge it before storage, and give it a refreshing charge every 3 months. See Section 7. Charging Off-Vehicle.

Battery Maintenance in Non-Automotive Float Applications

a) Typical applications are motor-generators, stand-by applications etc. The Leisure Battery range is recommended for these applications - standard vehicle batteries are not suitable.
b) Batteries used in these applications should be changed every 2 years or more frequently. (Continuous charging, even from a well-controlled charging system, will result in internal degradation of the battery. This could result in the battery not giving it's predicted output when required even though the battery appears to be fully-charged).
c) Ensure that the battery is always kept in as high a state-of-charge as possible without causing excessive overcharge. Always recharge immediately after use.
d) Check the electrolyte levels on a regular basis dependent upon use, but not less frequently than monthly. Charging batteries continuously on a non-vehicle charging system may result in a higher rate of water loss.
e) Check that the battery is clean and dry and that the vents are not obstructed.
f) If the battery is not to be used for an extended period (more than 1 moth), fully charge it before storage, and give it a refreshing charge every 3 months. See Section 7. Charging Off-Vehicle.
g) Best practice is to define a regular maintenance-routine, and to record the results. This should include such variables as the amount of water added to each cell, specific gravities in each cell, battery voltage etc.

Use of Battery Additives

a) Shield Batteries do not recommend the use of battery additives.
b) The use of these invalidates the guarantee.

Label Information

Note Operating Instructions

Shield eyes - eye protection must be worn

Keep away from children

Battery acid - corrosive and poisonous

No smoking - no naked flames - no sparks

Explosive gases

Never dispose of as domestic waste - take to a designated waste reclamation site

Battery is recyclable - follow local recycling & reclamation procedures